BPL—An Unwanted Earful

Coming Soon To A Radio Near You—A Speakerful Of BPL Noise!

By Rich Arland, K7SZ

The single most important issue today that will affect all of us who use the radio hobby to keep abreast of current issues and/or provide communications in times of disaster is BPL, which stands for Broadband over Power Line. It's a carrier-current system used to deliver Internet data to homes and businesses using overhead local power lines as the transmission medium.

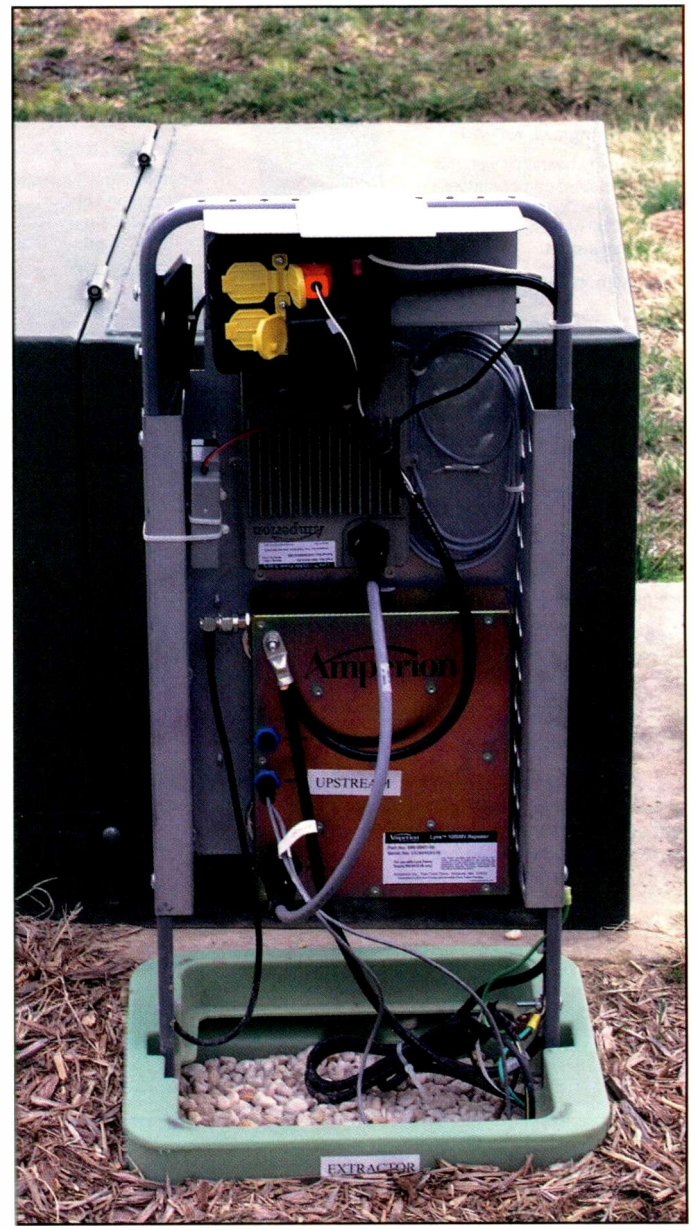
In an effort to increase the availability of the Internet to more potential customers over a wider geographical area, many power companies throughout the United States are entertaining the idea of offering high-speed Internet access to large areas of the country using the existing AC power lines as carriers. The emphasis here is on rural areas, where digital subscriber line, satellite, and cable modem access is severely restricted or, in some cases, non-existent. BPL signals will be carried over your "local" power lines.

Unlike cable TV where the cable itself is shielded, BPL causes major interference in your neighborhood, because the "transmission lines" are in your front or back yard! BPL also uses a large portion of the radio spectrum (2 to about 80 MHz), a portion of spectrum radio enthusiasts have used for years to effectively transmit low-power signals around the world.

On the surface, the idea of using the existing power grid to act as a carrier for digital data is not a bad one. Unfortunately, there are a multitude of technical hurdles to overcome to make this new medium workable. The idea of sending information over existing power lines dates back 40 to 50 years. Do you remember the "carrier current" intercoms that were popular 30 years ago? The specially designed base and slave intercom stations used the existing AC building wiring to send signals and audio information between intercom units without the need to run extra wiring. On a closed-loop/local level, this technology works extremely well. Problems occur when you try to implement wide-area coverage, like that needed for Internet connectivity to a huge section of the population.

Several BPL field trials are being conducted in the United States using both ground- and pole-mounted equipment, like that shown in the photos. Where these trials are taking place the interference ranges from moderate to extreme.

The technology needed to overcome these extremely complex problems is only one part of the equation. The interference issues associated with BPL is another. Actually, the technological issues are taking a back seat to the interference issues, pri-



Here's a rare view of an open ground-mounted pedestal used by Progress Energy, a North Carolina-based energy provider. The company is engaged in a trial of BPL equipment manufactured by Amperion in the Raleigh, North Carolina area.

This pedestal, in North Carolina, is in the tall, lighter green box with its cover on.

marily because of the activities of the American Radio Relay League (ARRL), the national organization representing amateur radio, located in Newington, Connecticut (www.arrl.org).

The ARRL has raised over $300,000 from approximately 5,600 of its members to fight the acceptance of BPL. This money is a drop in the bucket when compared to the hundreds of millions of dollars that have been amassed by the power companies and technology developers bent upon shoving BPL through the FCC's "BBRT" (Big Box of Red Tape).

BPL is making national and international news. In a recent *Wall Street Journal* article about BPL (March 23, 2004, page A1), the *WSJ* reporter was less than kind to the ham radio fraternity in general and the ARRL in particular. Categorizing hams as a bunch of old fogies enjoying an arcane hobby that has long since run its course, the article went on to point out the tremendous impact BPL would have on urban and rural areas of the country by providing high-speed Internet connectivity at modest prices. This "modest price" issue is one which is entirely relative, based upon your current ISP (Internet Service Provider) and what you consider "modest."

The *WSJ* article fell well short on more than one point, however. In addition to "down talking" the ham radio population of the United States, the article went on to quote statements by one of the FCC engineers, who stated that the interference problem was virtually "non-existent." This same individual complained about having to deal with the whining ham radio operators and the ARRL, and didn't understand what all the fuss was about. Anyone with even a modicum of electronics training and/or a ham license reading the *WSJ* article would quickly spot the technical weaknesses and the utter nonsense espoused by the FCC engineer.

The Nitty-Gritty Of BPL

BPL uses one of four methods to place digital data onto existing AC power lines that are part of the National Power Grid (a section of which failed last year, leaving much of the East Coast dark!). These modulation/multiplexing schemes all have one thing in common: they use frequencies in and around the HF portion of the spectrum.

HF resides between 3 and 30 MHz and is the portion of the radio spectrum that allows international communications by way of bouncing (refracting/reflecting) RF energy off the various layers of the ionosphere. Without the ionosphere, HF propagation (the ability to bend signals to cover vast areas of the Earth's surface) would not be possible. That means shortwave listening and HF amateur radio would not be possible.

The carrier medium in this latest FCC brain storm is the existing U.S. power grid. The industry's story goes like this: Modulate the power lines with Internet data that cover the majority of the HF spectrum and you can claim to provide high-speed Internet access to the masses. Now here comes the rub: The interference generated by the modulation/multiplexing schemes will radiate like crazy over the power lines. After all, the power lines are nothing more than long runs of wire, which strangely resemble antennas. So why is it so difficult for the FCC engineers to get their minds around the concept that this RF energy will radiate like mad from these power lines? Instead, they bury their collective engineering heads in the sand and fail in their job to let the Commissioners know the down side of BPL.

Shortwave And Ham Activities Affected

For over 40 years I have been an avid shortwave listener and a proponent and practitioner of QRP (amateur radio operation under 5 watts). QRPers, those who practice the art and science of low-power communications, know very well that it does not take huge amounts of RF energy to communicate all over the world. It only takes efficient antennas—big, looooong, efficient antennas. Looooong, like in AC power lines? Hmmm, we're not talking rocket science here, folks.

The idea of not being able to pursue my SWL hobby and ham radio is not acceptable. Fact is, you don't have to live a mile or less from power lines to encounter BPL's wrath. Remember how those low-power signals from radios use the ionosphere to be heard hundreds or thousands of miles away? The same concept is true for overhead power line BPL signals. Suddenly the BPL problem isn't just a local or regional problem, or even an American problem!

The FCC accepted comments on BPL and was deluged with e-mails and letters, mainly from ham radio operators, and to a lesser degree from FEMA (the Federal Emergency Management Agency) and the NTIA (National Telecommunications and Industry Association), concerned about the interference aspects of BPL. After all, left unchecked, BPL could easily spell the end of HF communications as we currently know it. Certainly it will adversely impact QRP operations on HF, with the QRP signal being several decibels *lower* than the BPL data levels! Trying to DX any weak SW stations will also be next to impossible.

Here's a photo of a pole-mounted "Extractor," made by Amperion and used in the Progress Energy trial near Raleigh, North Carolina. The vertical "rod" or bar attached to the side of the cabinet is an 802.11b "WiFi" antenna. This Extractor picks the data off the BPL signal and converts it to WiFi for a hop across the street where it's re-injected into the underground power line as BPL to be distributed around the neighborhood. The Extractor is coupled to the power line by induction at those clamps hanging on the line on the right side of the picture. There is no physical, electrical connection to the line. Amperion says that the hardware can be attached to a live power line with normal precautions.

Okay, let's look at another licensed service that is a *major* user of the HF spectrum. FEMA has a number of HF frequencies for disaster relief coordination efforts. With the emphasis that our federal government is placing on Homeland Security, it is hard to believe that FEMA disaster relief efforts might be jeopardized by BPL. But they will, indeed.

One interesting aspect to note is that the major user of the HF spectrum, namely the Department of Defense, has not weighed in on this issue. This is nothing short of amazing, since a significant increase in HF interference levels would have an adverse impact on flight-following, SAR (Search & Rescue) operations, Homeland Security, and a host of other military HF communications.

In a recent NPRM (Notice of Proposed Rule Making) the FCC kept the existing interference standards under Part 15 (that portion of the FCC rules and regs that governs things like BPL) and reiterated assurances to the ham radio community that, as a licensed service, their rights would be protected under any change of Part 15. While this sounds comforting on the surface, one wonders whether or not the enormous pressure from the "high rollers" who are footing the bill to build the BPL infrastructure might not move the FCC in another direction. One must look back only 18 years to the Electronic Communications Privacy Act of 1986, and the heavy lobbying by the cell phone industry as a prime example of "money talks and BS walks."

Interference That Works Both Ways?

While hams have been very vocal about being interfered with by BPL data streams, my take on this interference problem is exactly the opposite. This interference thing can work both ways. Radio amateurs, and anyone else who is a licensed user of the HF spectrum, have the potential to easily interfere with BPL data, especially when using power levels in excess of 100 watts.

Envision this: You have a football stadium that will hold 40,000 fans. Two of these fans are ham radio operators and the rest are BPL subscribers. The two *federally licensed* hams are interfering with the 39,998 other fans (BPL subscribers). Now who do you think is going to be singled out by the power companies, ISPs, and the FCC for "special" attention and enforcement? Why, the two hams, of course; after all, this is *Amerika*, where the majority rules, except under "special" circumstances, like political correctness and certain governmental programs.

But Even More Important...

So far we've talked about the interference aspects of BPL. Let's take a quick look at the *security* aspects. BPL will radiate over the power grid. How safe are your Internet transactions from unauthorized interception by hackers, the federal government, and others who might have malicious intent? Answer: you are not secure at all unless you utilize some form of encryption. And now, with the Patriot II Act, if you utilize any form of encryption that could be construed as a way to circumvent official government monitoring of your actions you will receive a rather nasty sentence if convicted of a crime under Patriot II. Don't think for one second that our government can't (and hasn't

FCC Denies ARRL Extension Request

In its infinite wisdom, the Federal Communications Commission has denied the League's request to extend the deadline for comments and reply comments in the BPL Notice of Proposed Rule Making (NPRM) in ET Docket 04-37.

All is not lost, however, as you can still write to your Congressional Representatives expressing your concerns about BPL. It might also help if you contacted your local media and show them a copy of this article!

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Here's a pole-mounted "injector." All the pole-mounted boxes look the same: injector, repeater, and extractor.

in the past) manufactured evidence against innocent citizens. This makes "war driving" in search of open microwave WiFi (wireless fidelity) systems pale in comparison. Think about this if you have any reservations about becoming involved in fighting BPL.

What You Can Do

By the time this article is in print the FCC will not be accepting any further comments from the public on BPL. So now what can you do? The FCC is funded by Congress. They *do* listen to the folks who write their paychecks, believe it or not. Write your respective Representatives in both houses and express your concern about BPL. One word of caution: *Be polite, be courteous, and don't rant and rave.* Form your thoughts and pen them *intelligently* and with *restraint.*

If you'd like more information about BPL, including how it sounds on a radio, and what *you* can do to enlighten folks about its adverse effects—not only as it relates to your radio monitoring, but also to CB, public safety, and government communications—visit the *Popular Communications* website at www.popular-communications.com. You can also hear what one provider's BPL signal sounds like on HF by going to http//www.cq-vhf.com/BPL.html. Don't wait until BPL is deployed! ■